MARINE REVIEW.

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Cleveland Harbor Improvements.

Col. Jared A. Smith, United States engineer at Cleveland, now has in hand for harbor improvements at this point about $400,000, and the sundry civil appropriation bill, which is nearing final consideration in congress, will provide $294,000 additional. This latter item will be available after July 1 next. Of $1,354,000 authorized in the river and harbor act of June, 1896, for continuous contracts at Cleveland, more than half has already been appropriated, or, to be exact, such will be the case when final action is taken on the bill now before congress. The Cleveland item in this bill is assured, almost beyond any doubt. Col. Smith is therefore prepared to open bids on the 29th inst. for the entire foundation of the east breakwater extension—about 3,000 feet. The east breakwater now has a length of 2,494½ feet. The present plan of this breakwater contemplates a length of 3,500 feet, measured on a straight line from the east side of harbor entrance and thence a distance of 2,000 feet obliquely toward the shore to a point approximately on the prolongation of the west side of Muirson street, and about 2,250 feet outside of the shore line. About 100,000 tons of stone will be used in the 3,000 feet of foundation. It is expected that about half (1,500 feet) of this will be put in during the coming summer. The top of the foundation is to be 68 feet wide and is to be left at a plane 25 feet below mean lake level. If half of this foundation is put in during the coming summer, it is the intention of Col. Smith to be prepared with a contract for the superstructure, so as to complete 1,500 feet of the extension in 1898.

Estimates of materials are also being made, so as to let a contract shortly for the rebuilding of the west pier at Cleveland. The matter of title to certain lands, which has delayed this improvement, is not as yet fully settled, but the work of construction will go on irrespective of this difficulty, which involves only a small part of the plans, and which may be settled before contracts are let. The new west pier will be a very substantial structure, similar to the east pier—timber substructure filled with stone, and stone and concrete superstructure.

Lake Freights, Insurance, Etc.

As yet only three tows, seven vessels in all, and all of them of the smaller wooden type, have been secured by the shippers who have been offering Escanaba ore at 45 cents for the season. If these shippers had coal for Green Bay or Escanaba to offer at 25 cents in connection with the ore, they would probably get a few more vessels, but the freight is not attractive, even with an abundance of coal for trips up the lakes. There has been no 60-cent ore—season business from the head of the lakes—offering for more than a week past, but one small block, about 18,000 tons, was covered a few days ago at 55 cents, the charter running until Sept. 1. A contract of this kind is regarded by owners of boats capable of carrying package freight as more favorable than 60 cents for the season. The opening rate from Escanaba for single trips has been fixed at 40 cents. Very little soft coal has been offered for shipment as yet. The rate governing the few charters that have been made of late has been 20 cents to both Lake Michigan and Lake Superior ports.

Aside from the regular business of Johnson & Higgins with the big steel lines, the Prime-McCurdy syndicate seems to be capturing all insurance, the old general agents working with them in several cases. New companies in the syndicate this year include the British & Foreign, Etna, Greenwich and Detroit Fire & Marine, bringing the total assets up to $50,000,000.

Lake Outlet for Pittsburg Steel Products.

Andrew Carnegie evidently expects to develop on a large scale shipments of iron and steel products from Pittsburg by way of his railway to the port of Conneaut on Lake Erie, and thence by lake and canal to the east. In a recent communication to the Pittsburg Dispatch, he says:

"We are upon the threshold of another important advantage. The Erie canal is being deepened to 9 feet. When this is done the cost of transportation between Pittsburg and New York, Boston and all northeastern points will be less than one-half present rates for seven busy months of the year. Barges between Conneaut and New York will leave each point daily, and to transport the products from Pittsburg to Conneaut in cars which would otherwise move empty to the lakes for ore, will cost little. A canal transporter has given me 75 cents per ton by barge line from Conneaut to New York at his price upon the deepened canal. Between Conneaut, Milwaukee, Chicago and other lake ports transportation will not cost more. When these barge lines are established and the Ohio is improved, Pittsburg will be the best distributing, as it is now the best manufacturing, point in the United States."

Mr. G. J. Harris of Chicago, general western agent of the Canada-Atlantic Transit Co., sends the following copy of a note regarding Parry Sound harbor buoys, which he received, a few days ago, from the general manager of the line in Canada: "We are advised that the Canadian government are to put in for the Parry sound route a gas buoy at Seguin bank and one at Gordon rock, in addition to the light that is now there. They will also put up one more special range of lights and twenty additional channel buoys, so that there will be no difficulty in getting into Parry Sound harbor either by day or by night after these improvements are completed. The gas buoys have already been ordered."

A powerful tug, the Gettysburg, building at the works of the Harlan & Hollingsworth Co., Wilmington, Del., for the Philadelphia & Reading Transportation Co., was launched a few days ago. The Gettysburg is to be one of the finest tugs in the country.

A Great Day at Lorain.

While returning to Cleveland, Wednesday, after the launch of the steamer Superior City, one of the large party of engineers who attended the launch said: "I learned that in the sides of that steamer there are plates weighing 6,300 to 6,500 pounds. Some of them are 29 feet long and 4½ feet wide. Alike to the heavy stern and bow pieces, shapes, channels, etc., these plates were moved by pneumatic lifts and electric cranes from the time they left the railway cars until they were put in place on the ship. They were handled by labor-saving machinery in and around all the tools that prepared them for their places in the vessel. I was impressed also with the great saving of rivets in such plates, as against the smaller plates and smaller parts in a ship generally where modern facilities are not at hand."

This was the view of all of the engineers who witnessed the launch of the Superior City and examined the new Lorain yard. There was a very large number of them present. The Engineers' Club of Cleveland had a special car. Several ship builders from other cities were also in attendance, among them Frank E. Kirby, F. A. Kirby and C. B. Calder of Detroit, Hon. F. W. Wheeler of West Bay City, Mr. Newman of the Globe Iron Works Co. and Mr. Gaskin of the Union Dry Dock Co., Buffalo. The launch was attended by unusual festivities, and as it was the first at the Lorain yard there were thousands of people to witness it from the surrounding country. Several hundred invited guests partook of a luncheon in the mold loft, and short addresses were made by Mayor J. B. Coffinberry of Lorain, Mayor Leavengood of Elyria, and Mr. J. M. Hoyt, who represented the owners of the vessel. Messrs. Robert and James Wallace, as well as the directors and others connected with the management of the Cleveland Ship Building Co., were warmly congratulated upon the success of the launch and the completeness of their new plant.

The ship yard and the new vessel have been fully described in previous issues of the Review. The Superior City will be owned by Mr. A. B. Wolvin and others. She is 430 feet between perpendiculars, 450 feet over all, 50 feet beam and 28 feet deep. She will have a quadruple expansion engine with cylinders of 17, 25½, 39 and 60 inches diameter and a common stroke of 40 inches. Babcock & Wilcox water tube boilers of 7,000 square feet heating surface will furnish steam at 250 pounds pressure.

Examination for Steamboat Inspection Service.

It is again announced that the United States civil service commission has experienced considerable difficulty in securing eligibles for filling vacancies in the steamboat inspection service. The list of eligibles—those who are qualified for places and whose names and examination records are kept on file by the commission—is especially small on the lakes, as there were few responses to previous announcements regarding examinations in lake cities. On the 25th inst. another examination will be held at all places throughout the United States where the commission has competent boards of examiners. This examination is especially intended for two vacancies in the district of Alaska—one in the position of inspector of hulls and one in the position of inspector of boilers. Persons desiring to enter this examination should at once apply to the United States Civil Service Commission at Washington for a copy of the manual and for application blanks, forms 304 and 363, which should be properly executed and returned to the commission.

A. S. Chapman writes of "Car Ferrying on the Great Lakes" in the April number of Cassier's Magazine. The article is accompanied by elegant illustrations of the car ferry steamer Pere Marquette and the car floats of the Lake Michigan Car Ferry Transportation Co., which are towed by tugs more than half the length of Lake Michigan, from Chicago to Peshtigo, Wis. There is also a clear illustration of the Shaw & Speagle steam towing machine, which is in use on these barges, as well as on all modern steel schooners of the lakes. A Cleveland ship builder, who recently visited the works of the American Ship Windlass Co., Providence, R. I., where these machines are made, says the plant is a model of neatness, and he found it crowded with work on orders from all parts of the United States. Several machines building on foreign account were also under way. He was greatly impressed with the methods of the Providence company and the system that prevailed throughout the works. Orders had just been received (within two weeks) for three steam towing machines—one to go to the Roach ship yard at Chester, Pa., for a Standard Oil barge, another for a steel barge building at the works of the Chicago Ship Building Co. for the Minnesota Iron Co., and the third for a tug that is being built for Mr. Lewis Luckenbach.

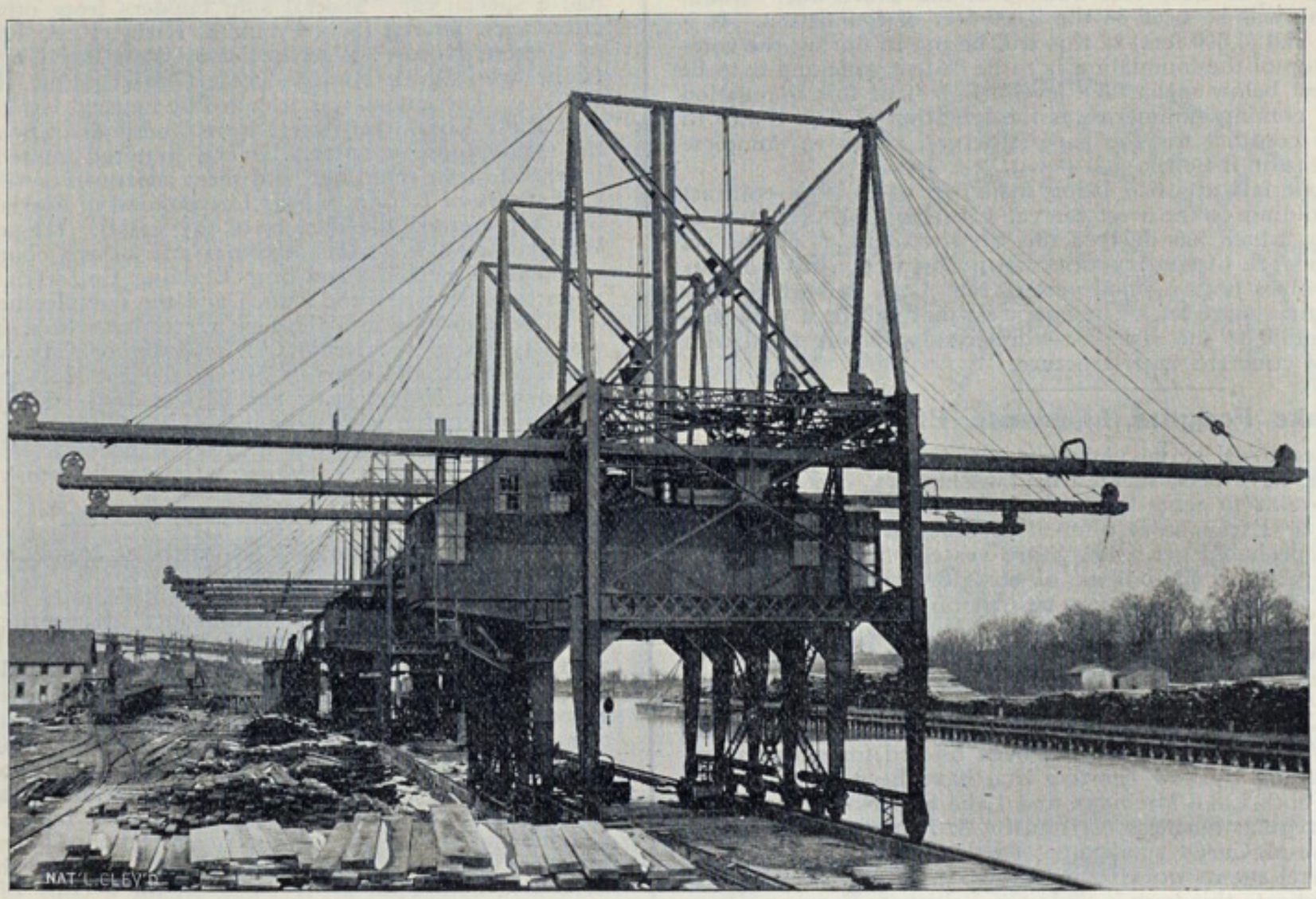
Major Clinton B. Sears, corps of engineers, U. S. A., opened bids at Duluth Monday for building concrete footing blocks for the superstructure of the south pier, ship-canal entrance to Duluth harbor. King & Steele of Duluth were the lowest bidders at $4.95 per cubic yard of concrete. It is proposed to expend about $12,000 on this work. Other bids per cubic yard were: Michael Rabbitt, Toledo, $18.09; Norris & Fitzgerald, Duluth, $5.47; Stamsen & Blome, Chicago, $5.93; Davis & Davis, Duluth, $6.74; Nilson & Carlson, Duluth, $5.67; Frank Campbell, Duluth, $6.90; G. H. Sager, Chicago, $6.20; Emil Engle and Aquila G. Osman, Duluth, $8.49; Lipsett & Gregg, Sault Ste. Marie, $8.69; John F. Schleunes, Duluth, $5.63.

Another appropriation of $1,000,000 for river widening in Cleveland has been authorized by the Ohio legislature. It is proposed to spend this money in improving the river above the Central viaduct.

New Ore Machinery at Conneaut.

Ore handling facilities at Conneaut, the lake terminal of the Pittsburg, Bessemer & Lake Erie Ry. (Carnegie ore and coal road), are illustrated on this and the opposite page. The latest feature of improvement at Conneaut is the plant of new McMyler machines for direct loading from ships to cars. Since the docks at Conneaut became the property of the Bessemer road, a slip 160 feet wide and 1,000 feet long has been dredged, materially increasing the harbor facilities. The dock improvements have been going on for two years. The old storage docks, which extend back 325 feet from the water and are 2,000 feet long, are now spanned by fifteen ore convevors. Six of these were built by the King Bridge Co. of Cleveland, and nine by the Brown Hoisting & Conveying Machine Co. All have been in use for two years.

The notable new features of the dock equipment, however, are the rapid ore unloading machines, installed in the past winter by the McMyler Mfg. Co. of Cleveland. Something of their efficiency will be gathered from the statement that 800 tons of ore per hour can be unloaded by them, and that the largest steel freighters of today can be unloaded in seven hours, as against fourteen hours and upward under ordinary methods, for boats of average capacity. The plant is for direct loading into cars and hence is located on the recently dredged slip. It consists of twelve legs, divided into four separate groups of three machines each, running on a 20-foot track. By means of a rack and pinion, the outer legs of each group of three may be moved from a 21-foot center to a 36-foot center, thus accommodating the legs to any difference between hatches. The four groups move on the track by means of a bevel gear working on the side of the wheels. Each leg spans five railroad tracks, two being under the machine and three under its cantilever. On the water side of the machine the boom extends to the farther side of the vessel, which permits more than one bucket to operate in the same hatch, and at the same time makes it possible to lift the buckets perpendicularly rather than at an angle. The power for operating each machine is located in its central leg. The boiler and one engine are on one side and the two engines for the other legs are on the other side of the central leg, thus permitting the operator to see the bucket in every position when not in the hatch. The hoisting will be done direct from the crank shaft, no gearing being used. This insures less vibration and friction and the highest speed possible. The trolley can be stopped and lowered without going into a lock, at any point over the vessel's hatch. The buckets dump automatically at any height above the cars on any of the five tracks.



MACHINES FOR UNLOADING ORE INTO CARS, CONNEAUT, O.—BUILT BY McMYLER MNFG. CO.

Steel cars will be used largely in connection with this plant. By June 1 the Schoen Pressed Steel Co. of Pittsburg will have built for the Bessemer road 1,000 of these cars. Each car weighs 34,000 pounds and will carry 100,000 pounds. With the monster mogul engines included, the average train load will be 1,500 tons. Quite recently a train of thirty-five steel cars pulled out of Conneaut carrying 1,528 gross tons of ore. The total weight of the cars was 535 tons, or only 26 per cent. of the total load of 2,063 gross tons, making the 1,528 gross tons of ore carried 74 per cent. of the total load.

On the east side of the new slip at Conneaut, opposite the fast ore plant described above, will be located a car-dumping machine for the transfer of coal from and to vessels. This machine is now under construction at the works of the McMyler company and will soon be erected. It will also be a modern plant in every particular. We are indebted to the Iron Trade Review for the engravings.

Subscribers who wish to have the Marine Review delivered to them through the marine postoffice, Detroit, will please notify us at once.

Primitive Steam Vessels of the United States.*

REMINISCENCES OF MARINE STEAM ENGINE CONSTRUCTION AND STEAM NAVIGATION IN THE UNITED STATES, FROM 1807 TO 1850.

By Charles H. Haswell, M. I. N. A., etc., etc.

Marine steam engines of primitive construction, and down to 1822, were of the vertical cross-head type, connected with sliding clutches directly to the water-wheel shafts, and geared also to a shaft with a fly-wheel at each end of it. The object of the connection was to enable the water-wheels to be disconnected, and the engine operated independently, so as to feed the boiler and operate the bilge pump when the vessel was at a pier or anchored, as independent steam feed, bilge and fire pumps were then unknown. The steam and exhaust valves, if puppet, were operated by the hand gear of Beighton; when otherwise, the long slide valve was used. This type of engine, with the cross-head, connecting rods, cranks and shafts of cast iron, the key, crank and pin holes cored and cast in, was wholly used until about 1822, when the vertical overhead beam was introduced. Up to this period (1822), and for several years after, the vertical engine only was constructed, and when the horizontal or inclined engine was introduced the short slide was resorted to, except in southern and western waters where the lever puppet valve, operated by a cam, was wholly used.

The boilers, with the exception of the very first few, which were plain cylindrical set in masonry, were of copper plates of design termed "D and Kidney Flue," having but one furnace, full width of inner space of front, the flame and gases of combustion leading through a flue of about two-thirds width of furnace into a back connection, and from thence into a return flue, which from the outlines of its transverse section was termed a "kidney flue;" and from thence to a short vertical flue at the back of the furnace, and then extending up to the shell of the boiler, in a short shoulder of which the base of the smoke pipe was set. This convexity to the inner side of the main flue, and the indentation given to the inner side of the other, was due to the fact that the curved surfaces rendered socket bolts unnecessary with the limited steam pressure of 15 pounds or less per square inch. On southern and western waters, where non-condensing engines alone were resorted to, in consequence of the waters of the rivers being too turbid for the continuous operation of a condenser, wrought iron cylindrical boilers alone were used. They were generally internally flued, in some cases externally fired, and it was not until about 1820 that marine boilers were constructed of iron in eastern waters.

Boiler plates were punched manually by the aid of a long wooden lever, on which four men exerted their force, and as the location for the punch was directed only by the eye of the operator, the spaces were frequently irregular, involving pinning, in order to bring the holes as nearly opposite as practicable, and hence the plates were frequently strained and the rivets set at an inclination; all of which were hand made.

Blow-offs were not attached to boilers until steam navigation was well advanced; the exact period is not now ascertainable, probably about 1822. Steamboats on the bay and river routes, with low pressure steam and consequent temperature of it, did not involve the necessity of frequent blowing off of saturated water from their boilers, as the water was let out at the end of each passage, and they were refilled with fresh water. In consequence of this neglect of blowing off, and the imperfect manner

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*Charles H. Haswell of New York was the first engineer-in-chief of the United States navy. He is over eighty years of age and has been in close touch from boyhood with everything pertaining to the development of the marine engine. This paper was prepared for the thirty-ninth session of the Institution of Naval Architects, held in London a few days ago.

in which the plates were riveted, a boiler at the end of a trip in wholly, or even partially, salt water would be loaded in its seams and joints with incrustations and stalactites of salt to an extent that involved the hammering and scraping off of them at the termination of the route. Felting of a boiler was unknown.

Cranks and Crank Pin.—The shaft hole of cranks was octagonal, and they were secured to the shaft with flat keys, the interspaces fitted with a cement of iron borings and salammoniac, and as the distance between the centers of the crank, from the varying shrinking of the metal and the casual settling of the cores, would vary from that of the exact required length of half stroke of the piston, the pin was forged with two longitudinal centers, one for the hub and the other for the eye of the crank, and when the pin was fitted and seated it was held in position by a key in its end, which protruded beyond the eye of the crank.

Finishing.—So deficient were the facilities of lathes, planers, slotters and drills, that "black work" of engines, as it was termed, was the prevailing finish. The connecting rod of a large vertical beam engine in the Victory was wholly finished in the smith's shop, the body of it after forging being dressed by swaging, the key holes drifted, and the ends and straps dressed with a flatter on an anvil and a horse file. Cylinder piston packing consisted of hemp gaskets, and if the safety valve of the boiler was not raised during the initial raising of steam the steam around the chimney flue would become so dry as to char the wood blocking between the ribs of the piston, and also the piston packing; hence lead pipes through which the gaskets were drawn were resorted to. Counters, indicators, salinometers, brine pumps, steam and vacuum gauges, metallic packing and oil cups, other than the one in the cylinder head by which the piston was lubricated on its exhaust side, were unknown. Cut-offs were operated by a cam on the water-wheel shaft; hence upon the closing of the cut-off valves all the steam in the pipes between the valve, and in the side pipe up to the steam valve, was added to that expended without any effect compensating for its flow. As a result, it was sought to save this expense, and Robert L. Stevens of Hoboken, N. J., designed the cutting off of the steam directly by the steam valve.

Steam Chimney.—In 1827 James P. Allaire of New York invented the steam chimney. The original design was that of two cylinders of boiler plate, one within the other, connected and closed at both ends, the interspace being about 5 inches in width, with a vertical diaphragm, connected near its upper end to the outer shell above where steam was admitted from the boiler through two or more connecting pipes. These latter served also as fastenings, and to hold the chimney in position. The diaphragm led down to within a few inches of the bottom of the chimney, and the steam was inducted down and under it, then up and around the inner cylinder, and then to the steam pipe opening in the top. Thus the steam deposited its contained water in the chimney, to be vaporized by the heat at the base of it, and received also heat from that ascending the chimney; hence a material economy of fuel was attained with the additional advantage of obtaining dry steam. Boilers at this period did not foam. The great proportionate volume of water, its area at the water line and the moderate heat in the furnace from wood, with but natural draught, precluded priming.

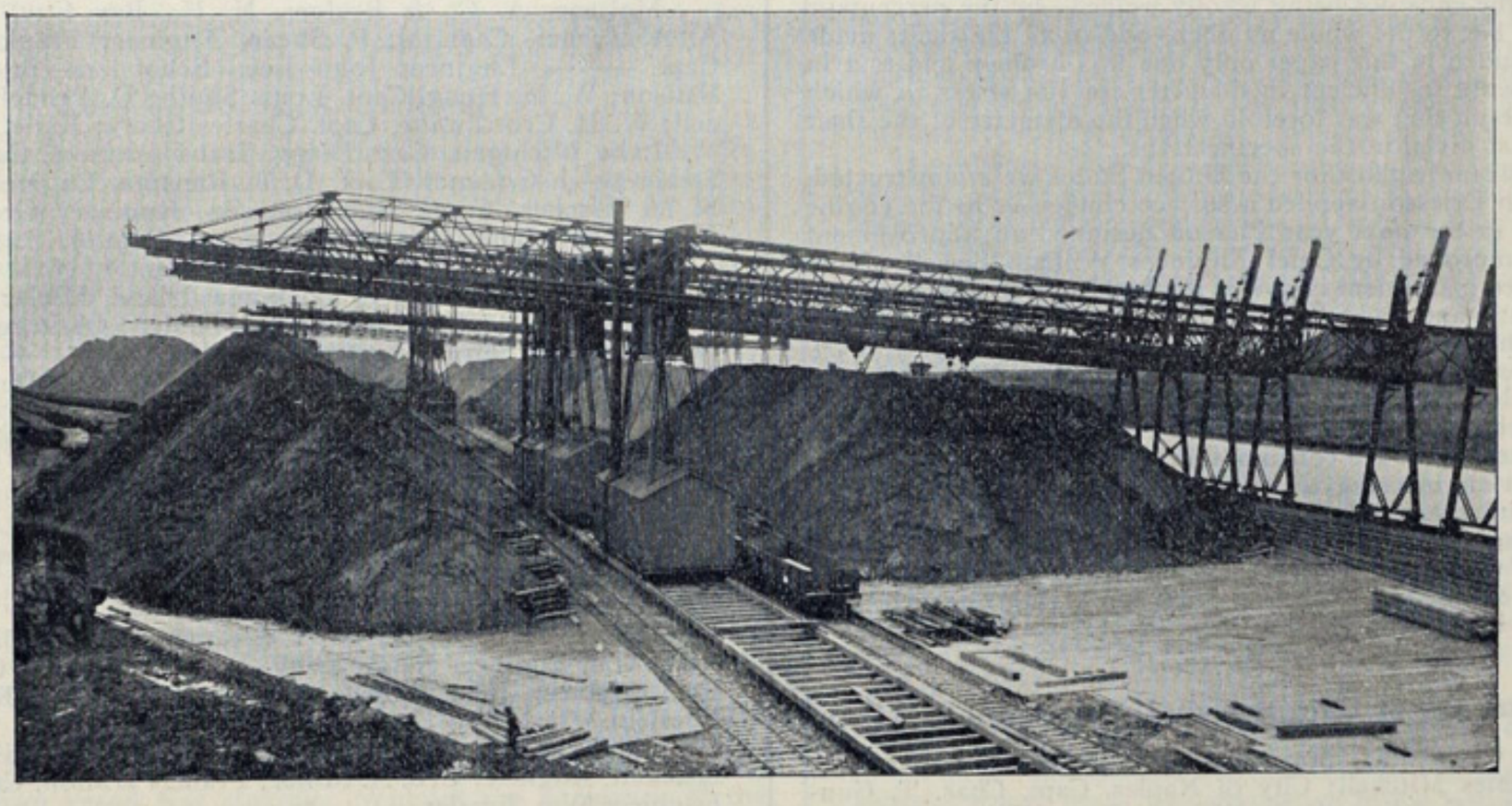
Compound or Wolf Engine.—About 1824 James P. Allaire constructed the steamboat Henry Eckford with a vertical cross-head compound engine having the center shafts geared to the water-wheel shafts, but in the absence of a receiver their mutual operations were only at the extreme of their opposite strokes. Soon after, and up to 1828, Mr. Allaire constructed five other boats, namely, the Sun, Commerce, Swift-Sure and Pilot Boy, with like engines, and the Post Boy with an overhead beam engine, the cylinders being set at opposite ends of it; but as this type of compound engine, operated at the moderate pressure of but 25 pounds per square inch, did not justify the increased cost and weight of two cylinders and their connection, the further construction of it was abandoned.

In 1828 the engine of a large steamboat, the Chief Justice Marshall, broke down on the route from New York to Albany. By the breaking of the head of her piston rod at its insertion into the cross-head pocket, the cross-head, both connecting rods and a center crank were broken. In four days new castings from the builder's patterns were made, the piston rod repaired, all fitted in place, and the engine ready for operation. In this connection it may be well to note that the eye of the crank was not reamed and neither were the key-holes of the rod slotted. These, with the crank eye and the ends of the rods, were submitted only to the operations of a coarse file.

Among attachments for engines and boilers was a steam gauge constructed in the smith's shop. It consisted of an iron tube, half an inch in diameter and 4 feet in length, bent so that one of its legs was 15 inches long in the clear and the other the balance of the full length. In this was placed a light pine rod, the rise and fall of which (shown on a tin plate that was divided and numbered in inches) designated the pressure of the steam in pounds per square inch.

Steam navigation up to the latter part of 1829 was confined to Long Island sound, the southern and western rivers, and Canadian lakes and rivers, with a single passage of a steamboat (the Phœnix, in 1807) from New York to Philadelphia, and one on the route from Havana to Mantanzas, as well as one from Charleston to Savannah. In 1819 the auxiliary steamer Savannah, 380 tons, steamed and sailed from Savannah to Liverpool, she being the first steamer to cross the Atlantic ocean. In 1825 Mowatt Bros of New York, owners of the steamboat Henry Eckford, attached a loaded barge to her and transported it from New York to Albany. This was the first essay of steam towing. In 1826 a fan blower was first introduced under the grates of boilers of the steamboat North America, owned by Messrs. John C. & Robert L. Stevens.

In 1828-29 the rivalry for speed between the steamboats plying on the New York-Albany route was so great that in the design of the boats their beam was made disproportionate to the weight of the engine, boilers and deckhouses. In this condition they proved unstable and large logs of light pine with sharp ends were firmly suspended under their after



STORAGE DOCK AT CONNEAUT.—MACHINERY BY BROWN HOISTING & CONVEYING MACHINE CO. AND KING BRIDGE CO.

wheel guards and depressed for half of their diameter below the water line. This improved the stability of the vessels.

Mr. Allaire's patent steam chimney was invaded in 1830 and the operation of it simplified by making the double cylinder an integral part of the boiler, open at its lower end and extending to such a height above the boiler as to give the necessary surface to superheat the steam, and the required height and volume of steam space to arrest foaming by admitting the subsidence of the water, physically borne with the steam in its flow to the steam pipe.

Gongs for engine rooms were unknown. In many of the boats, when the pilot was in his house, if there was one, or on the deck over the engine room, he would signal to the engineer by strokes of a stick or cane on the floor of the house or deck. All boats carried bells, and by them notices of arrival or departure were given. The bells also served for salutes between boats. To blow steam, as is now done by a whistle, was intended and held to be a challenge or insult. Fuel up to 1836 was wholly of pine wood. In that year experiments were made with anthracite coal. A steamboat on a route of six or more hours would not have capacity in her fire-room for all the wood required, and was compelled to carry it on her side houses. Boats on long routes, as from New York to Providence, were compelled to invade their upper decks, and upon leaving port often had the appearance of a floating wood yard. In 1836 James P. Allaire placed the steamboat David Brown, a light built river boat with deckhouses and promenade deck, on the New York-Charleston route. The enterprise was almost universally held to be utterly impracticable. It was successful, however, and soon afterwards Mr. Allaire built two other and larger boats for the same route, and from that period coastwise steam navigation was held to be so practicable that various lines to other ports were established. The David Brown was fitted for this new service with planking under her water-wheel guards, closely joined and caulked, extending from the inside of string piece to the light water line, which shielded the guards from being forced up by a sea. This device, after several essays at a proper term, is now known as the sponson. In some cases on coast routes instead of a close shield open slatting was resorted to.

In 1837 the first propeller was introduced, and in 1838 Phineas Bennet designed, patented and introduced in the steamboat Novelty, plying on the Hudson river, a vertical cylindrical boiler, in which a hermetically closed furnace was supplied with air by a pump and all the gaseous products of combustion of the fuel were driven into the steam-room of the

boiler. The object of this design was to increase the generation of steam and reduce the proportionate area of heating surface. The boiler, after a short period of service, was removed. Soon afterward Mr. Bennet introduced the design into a vessel built to ply between New York and Liverpool, under the condition with her builder that, if the design proved to be acceptably successful, he was to be paid for the entire plant of engines and boiler and his services, but if not successful he was to remove the entire plant at his own expense without any remuneration whatever. The engines and boilers were completed and operated, but they were not paid for by the builder of the vessel, and the boilers were soon after removed and replaced by others. In consequence of the ashes born into the valve chests and cylinders, and the evaporation of the oil of lubrication by the dry heat of the steam, the valves were rapidly worn and the cylinder pistons shrieked to a degree that would have rendered the design very objectionable, even if it had been successful in other points.

Capt. John Ericsson arrived in New York about this time, and in 1842 he designed and directed the construction of the engines and propeller for the United States auxiliary bark-rigged steamer Princeton.

1839.—Anthracite coal was introduced as fuel for steamboats, and to aid its combustion, when a high pressure of steam was required, a fan-blower, driven by a belt from the water-wheel shaft, was first resorted to, but soon afterwards a small independent engine, connected by a belt to the blower, was provided. It was not long until anthracite coal was burned with auxiliary draft in the open furnace of a steam boiler.

Wrought iron shafts were first made in 1840. Construction was entirely different to that of the present. Iron bars from 2.5 to 3 inches square, and of the greatest attainable length, were laid up with a square section, the abutting ends breaking joints with the other bars; hence the solidity of a section of the mass was subjected only to such imperfection as might arise from the ends not being wholly welded—by the percentage of the section of one bar to the whole number—and of all the shafts made up to the period included in this paper only one was broken, and that in consequence of its being insufficient in diameter for the stress to which it was subjected—a result that was foretold when the diameter of the shaft was reduced from that given in the specifications.

1842.—The first steam frigates for the United States were constructed.

1846.—Capt. John Ericsson applied a surface condenser to the engine of a revenue cutter; in the next year Pierson designed an improvement which was further improved by Chief Engineer William Sewell of the navy, and the perfected instrument is now in general if not in universal use.

1848.—The Atlantic and Pacific of the New York & Liverpool Steamship Co. (Collins Line) were constructed in this year, and in July, 1850, the Atlantic made the then quickest passage between New York and Liverpool, it being but 10 days and 15 hours. The Arctic and Baltic of the same line were launched.

It is impossible to obtain the consumption of fuel per indicated horse power in early steam engineering, as engines were not fitted with counters or indicators, and the wood was not weighed. In 1840, with auxiliary or blower draught, and in the absence of counters and indicators, it was computed by weighing the coal consumed and held to be about 5 pounds. The velocity of the river boat from 8½ statute miles in 1816 increased to 19 miles in 1850.

Appointments of Captains and Engineers.

Gilchrist, J. C., Cleveland: Steamers—City of Genoa, Capt. J. L. Weeks, Engineer James Mitchell; City of Naples, Capt. Chas. T. Gunderson, Engineer John C. Fritz; A. P. Wright, Capt. William Blattner, Engineer Elihu Harris; C. W. Elphicke, Capt. W. H. Moody, Engineer Henry Jesson; John Craig, Capt. J. C. Byers, Engineer J. Birney; R. E. Schuck, Capt. Fred. Goodell, Engineer John Parks; J. C. Gilchrist, Capt. A. E. White, Engineer C. N. Allbee; John B. Lyon, Capt. Ben Moshier, Engineer W. T. Schwacoffer; Cumberland, Capt. W. G. Stewart, Engineer James Hyde; Columbia, Capt. Chas. Hahn, Engineer B. D. Burrows; Hiawatha, Capt. J. P. Minsky, Engineer Stewart Brant; Oregon, Capt. W. C. Butts, Engineer ———; Waverly, Capt. Geo. Pollock, Engineer F. W. Hickey; V. Swain, Capt. Jas. Brines, Engineer ———. Schooners—F. A. Georger, Capt. Thos. Tucker; Moonlight, Capt. J. S. Jones; H. D. Alverson, Capt. R. Jannsen; W. S. Crosthwaite, Capt. Wm. Dandy; Verona, Capt. S. E. Philp; M. S. Bacon, Capt. G. W. Case; S. H, Foster, Capt. K. Hamringa; Thos. P. Sheldon, Capt. John McNamara; S. L. Watson, Capt. Frank Moore.

Bessemer Steamship Co., Cleveland: Steamers—Morse, Capt. E. M. Smith, Mate Thos. N. Bakewell, Engineer ———; Bessemer, Capt. C. E. Moody, Mate A. J. Montague, Engineer Richard Masten; Siemens, Capt. R. E. Byrns, Mate F. S. Tear, Engineer J. W. McEachern; Stephenson, Capt. John Lowe, Mate Geo. E. McMinn, Engineer H. J. Reynolds; Watt, Capt. F. W. Stenton, Mate W. J. Hunt, Engineer Frank Warner; Fairbairn, Capt. W. H. Campau, Mate Thos. Driscoll, Engineer S. W. Armstrong; Fulton, Capt. H. W. Stone, Mate H. J. Regan, Engineer J. B. Heyward; Ericsson, Capt. John Ward, Mate Peter Peterson, Engineer Duncan McVicar; Neilson, Capt. Harry Gunderson, Mate F. E. Ingraham, Engineer E. W. Fox; Cort, Capt. Samuel Allen, Mate E. Dyble, Engineer J. H. Norton. Schooners—Nasmyth, Capt. J. S. Van Rensselaer; Bell, Capt. A. McArthur; Thomas, Capt. Mat. Langell; Corliss, Capt. W. S. Hoag; Jenney, Capt. Frank Rice; Krupp, Capt. Samuel E. Lewis; Holley, Capt. G. L. Durand; Russell, Capt. Otis Holdridge; Whitworth, Capt. H. A. Byrnes.

Richelieu & Ontario Navigation Co., Toronto, Ont.: Steamers—Algerian, Capt. A. Dunlop, Engineer Thos. Wadsworth; Berthier, Capt. C. Gouin, Engineer D. Laviolette; Bohemian, Capt. J. McGrath; Canada, Capt. Thomas Dugal, Engineer G. Lefebvre; Carolina, Capt. Reverin, Engineer L. Latulippe; Columbian, Capt. G. Batten; Corsican, Capt. Esford, Engineer John Parker; Cultivateur, Capt. Raymond; Hamilton, Capt Baker, Engineer Geo. Marshall; Hochelaga, Capt. Mandeville, Engineer A. Chapullon; Hosannah, Capt. Mongeau, Engineer H. Gendron; La Prairie, Capt. Peter McLean; Longueuil, Capt. Jodiona, Engineer Boncage; Montreal, Capt. ———, Engineer F. X. Hamelin; Mouche-a-Fea, Capt ———, Engineer P. Bouchet; Passport, Capt. McDonald, Engineer W. Taylor; Quebec, Capt. L. O. Boucher, Engineer J. B. Gendron; Spartan, Capt. H. P. Granger; Terrebonne, Capt. E. Gouin, Engineer M. Sheridan; Three Rivers, Capt. F. St. Louis, Engineer F. Gendron.

Ottawa River Navigation Co., Ottawa, Ont.: Steamers—Sovereign, Capt. H. W. Shepard, Engineer Joseph F. Marchand; Empress, Capt. Alex. Bowie, Engineer Geo. Menish; Duchess of York, Capt. John McGowan, Jr., Engineer Alex. St. Laurent; Princess, Capt. Peter McGowan, Engineer Ferd. Piche; Maude, Capt. E. Gauthier, Engineer Narcisse Fugere.

Comstock, A. W., Alpena, Mich.: Schooners—W. K. Moore, Capt. B. Warwick; Interlaken, Capt. W. A. Edgar; Abram Smith, Capt. Charles Adams; Theo. Voges, Capt. Harvey Hyde.

Toronto Ferry Co., Toronto, Ont.: Steamers—Primrose, Capt. Chas. Tufford, Engineer Harry Brownley; Mayflower, Capt. Geo. Moulton, Engineer Edward Abbey; Shamrock, Capt. Thomas Jennings, Engineer D. Foley; Thistle, Capt. Alex. Martin, Engineer M. Murphy; Kathleen, Capt. John Fertile, Engineer ———; Soland Queen, Capt. Joe Tymon, Engineer Thos. Good; Luella, Capt. M. Corcoran, Engineer John Smiley.

Lehigh Valley Transportation Co., Buffalo: Steamers—Tuscarora, Capt. William Williams, Engineer F. H. Willson; Saranac, Capt. A. M. Todd, Engineer C. R. Plodeck; Seneca, Capt. D. Driscoll, Engineer J. Smith; Wilbur, Capt. P. McFarlane, Engineer N. Miller. Officers of wooden vessels of this line, not fully decided at opening of navigation, but will probably be the same as in 1897.

Chamberlin, C. A., Detroit: Steamer—Huron City, Capt. F. W. Manuel, Engineer Daniel Grieves. Tug—Champion, Capt. R. E. Furgeson, Engineer Jas. Purvis. Schooners—O. J. Hale, Capt. James Glen; Bay City, Capt. Andrew McKenzie; Lillie May, Capt. William Christie; Geo. H. Wand, Capt. L. E. Carey; Porter, Capt. H. H. Parsons; J. F. Card, Capt. H. B. Leonard.

McLean, A. C., & Bridges, N. H., Bay City, Mich.: Steamers—A. A. Turner, Capt. M. P. Shean, Engineer Frank Housback; Maine, Capt. ———, Engineer John Lee. Schooners—Buckhout, Capt. Wm. Patison; W. H. Hoag, Capt. Louis Smith; D. Pendell, Capt. Henry Pendell; W. H. Crosthwaite, Capt. Charles Gorry; Exile, Capt. P. Bowen.

Lake Michigan Car Ferry Transportation Co., Peshtigo, Wis.: Steamers—J. C. Ames, Capt. D. L. Ramage, Engineer F. P. Fitzgerald; S. M. Fischer, Capt. Fred. Johnson, Engineer Geo. Lynn. Barges—No. 1, Capt. James Cavanaugh; No. 2, Capt. J. P. Clark; No. 3, Capt. Alex. Leath; No. 4, Capt. Matt. Emerson.

Arnold Line Steamers, Mackinaw Island, Mich.: Steamers—Minnie M., Capt. Wm. McCarty, Engineer Madden; Ossifrage, Capt. J. B. Mondor, Engineer Patrick Eustice; Islander, Capt. ———, Engineer ———; Wau-kon, Capt. Joseph Goodreau, Engineer Geo. Densmore.

Wallace, David, Lorain: Steamers—Vega, Capt. W. H. Wallace, Engineer Bernard Wood; Vulcan, Capt. A. Oldorf, Engineer John McMonagle; Robert Wallace, Capt. J. Smith, Engineer Wm. Newcomb. Schooner—David Wallace, Capt. Alex. Porter.

Madden, Thos. F., Bay City, Mich.: Steamer—Lizzie Madden, Capt. M. J. Madden, Engineer James Chandler. Schooners—Mantenel, Capt. John Madden; Noquebay, Capt. Patrick Ryan; H. J. Webb, Capt. Chas. Keenan.

Adams, Thomas, Detroit: Steamers—Tom Adams, Capt. Duncan Nicholson, Engineer James Kelly; Jesse H. Farwell, Capt. D. J. Duncanson, Engineer John Johnston. Schooner—J. H. Rutter, Capt. John Eberlein.

Calbick & Co., J. A., Chicago: Steamers—Kalkaska, Capt. Henry S. Shackett, Engineer Geo. A. Miller; Francis Hinton, Capt. Wm. H. Evans, Engineer Wm. Frazier.

Slyfield, A. B., Port Huron, Mich.: Steamer—White Star, Capt. A. B. Slyfield, Engineer Joseph Paye. Schooner—E. S. Robinson, Capt. Geo. Slyfield.

Smith, L. P. & J. A., Cleveland. Steamer—Margaret Olwell, Capt. John F. Brown, Engineer P. Murphy. Schooner—Baldwin, Capt. J. Cottrell.

Goodman, F. C., Cleveland: Steamer—W. L. Wetmore, Capt. J. D. Mullen, Engineer C. T. Martin. Schooner—Brunette, Capt. H. Holmen.

Young, W. D., & Co., West Bay City: Steamer—Arizona, Capt. J. G. Sauer, Engineer Anthony Ward.

Benham, C. E., Cleveland: Steamer—H. B. Tuttle, Capt. J. H. McLeod, Engineer John Walsh.

Green, John, Buffalo: Steamer—Lewiston, Capt. Chas. S. Furey, Engineer James Green.

Construction of Lake Ships.

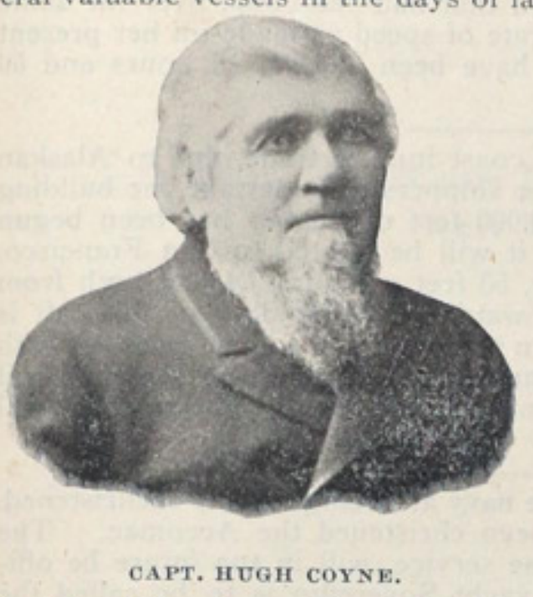
Editor Marine Review:—In a letter on "Strength of Ships," which appeared in your last number, it is stated that for several years lake vessels have been built to the rules of the great classification societies, and among them is named "English Lloyds." A correction is necessary, as "Lloyd's Register of British and Foreign Shipping," which I have represented here for about seventeen years, has never accepted any of these vessels as of sufficient strength to merit classification. As my views on this subject have already been stated in your valuable publication, I need not go further into these matters at present, but will merely point out that it will be found difficult, if not impossible, to construct ships to take the ground without suffering some damage. JOHN HAUG.

Philadelphia, April 11, 1898.

Mr. C. B. Calder of the Dry Dock Engine Works, Detroit, is very proud of the success that is attending the use of Howden hot draft in more than half a hundred lake steamers. The work of fitting steamers with this draft is a big item in the business of the Detroit works. "We never prepare a set of plans," said Mr. Calder, "without submitting them to the inventor, Mr. James Howden. We seek his counsel in everything and in this way he is informed at all times as to what we are doing. Not long ago we sent a quantity of our lake coal to Glasgow for special test under Mr. Howden's direction. We are certain of continued success with the use of this draft, as there is no guess-work about any of the various applications that are made."

Death of Capt. Hugh Coyne.

Capt. Hugh Coyne of Detroit, who was known as the owner of several valuable vessels in the days of lake schooners, and who was inspector of hulls at Detroit from 1874 to 1890, died at his home in that city on Thursday last. Capt. Coyne was in his seventieth year. He was born in New York state and went to sea when a boy. At nineteen he was master and part owner of a lake schooner. Among vessels in which he was interested were the schooners Wells Burt, Sunnyside, Sweetheart and Emma F. Coyne, and the tug John Martin, one of the first of the famous fleet of Detroit river tugs. He met with serious reverses in the panic of 1873, and he accepted the inspectorship of hulls at Detroit, holding that position for seventeen years. His resignation in 1890 was due to ill health. When he realized that his end was near, Capt. Coyne selected the following old friends to act as pallbearers: Capt. James W. Millen, Capt. Joseph Nicholson, Edward Webster, John Gillett, Thomas Murphy, Capt. Caldwell, of Amherstburg; Capt. McKay and Thos. Daly. At a meeting of Detroit vessels owners, held in the office of Parker & Millen immediately following the death of Capt. Coyne, suitable resolutions were adopted. Eber Ward presided and members of the committee on resolutions were Chas. W. Norton, J. W. Westcott and H. C. McCallum.



CAPT. HUGH COYNE.

Loss of the E. K. Collins.

Editor Marine Review:—I was very much interested in your illustration of a bit of china from the steamer E. K. Collins, picked up near Amherstburg by one of the sons of Andrew Hackett. I witnessed the burning of that steamer. We were at anchor above Amherstburg, bound for Chicago. We saw the fire break out, and I ordered a boat down the river with six oars, but after she had been run ashore her engine continued working and we could not get near her. The wheels flying around threw sand and gravel up at a terriffic rate, and many of those who jumped overboard were drawn under the wheels and killed. If the engine had been stopped many lives might have been saved. The engine continued to work until the frame was burned. Amherstburg has turned out some good sailors and brave men, and there were many of them willing to risk their lives at that fire, but the boat burned so fast and was put ashore in such a bad place that they could do nothing. The fire company also tried to render assistance, but the boat was nearly a mile below the town. Mr. Whaley, engineer of the Collins, was lost. His home was in Cleveland on Pearl street, West Side. The hull of the Collins was raised later and used as a lighter. When I arrived in Chicago, I learned that on the day of the Collins disaster the steamer Arctic, owned by Mr. Collins, was also lost off Newfoundland banks in collision with the French steamer Vesta, and Mrs. E. K. Collins was among those drowned. Capt. Luce of the Arctic sent his mate, Mr. Gourley, with a part of the crew, to offer assistance to the French vessel after the collision, and while they were gone he found that his own vessel was sinking. Without the assistance of the mate, Capt. Luce was unable to control the crew, and they jumped into the small boats, leaving the passengers to their fate. The French vessel sailed away, also neglecting the drowning passengers of the Arctic. Capt. Luce went down with the ship, but managed to reach a piece of a spar on coming to the surfate and saved both his boy and himself. I knew both Capt. Luce and Mr. Gourley. They were competent sailors and good men.

Alex. Anderson of Marine City is getting on well with the vessel which he has under way. The frame, of good oak timber, is nice looking and the vessel will undoubtedly be strong and seaworthy. My side-lights are getting poorer every day, but I can see the men working on this vessel from my doorway and hear the sound of the malls.

CHARLES GALE.

Sombra, Ont., Oct. 4, 1898.

Stocks of Grain at Lake Ports.

The following table, prepared from reports of the Chicago board of trade, shows the stocks of wheat and corn in store in regular elevators at the principal points of accumulation on the lakes, April 9, 1898:

	Wheat, bushels.	Corn, bushels.
Chicago	5,865,000	16,549,000
Duluth	3,760,000	3,339,000
Milwaukee	104,000	104,000
Detroit	68,000	156,000
Toledo	265,000	1,169,000
Buffalo	703,000	1,454,000
	10,765,000	22,771,000

As compared with a week ago, the above figures show, at the several points named, a decrease of 289,000 bushels of wheat and an increase of 177,000 bushels of corn. On the same date there was afloat at Chicago 737,000 bushels of wheat, 2,482,000 bushels of corn and 168,000 bushels of rye; at Duluth, 206,000 bushels of wheat; and at Milwaukee 335,000 bushels of corn.

The Marine Review has prepared in neat oak frames cards containing the schedule of time required to be run between certain points in the St. Mary's river under the new rules, which admit of increased speed. When hung in a pilot house, distance and time may be readily noted from these cards, as the type is large. They will be sent by express to any address at $1 each, or may be had upon application, 409 Perry-Payne building, Cleveland, for 65 cents each.

Around the Lakes.

The Minor Lumber Co. of Alpena is offering the propeller Westford and consort Monitor for sale.

Comstock Bros. of Alpena have sold their half interest in the steamer Porter Chamberlain to N. S. & H. D. Churchill for $2,000.

Lieut. A. H. Scales, U. S. N., has opened at Sault Ste. Marie the branch hydrographic office which was entrusted some time ago to his care. He will be assisted by Ensign Creighton Churchill.

The Corrigan schooner Northwest, sunk recently by collision with ice while bound from Chicago to Buffalo with a cargo of corn, lies in 12 fathoms of water, 3 miles south of west from St. Helena light and five miles west of McGulpin's point light.

Capt. George A. Zinn, corps of engineers, U. S. A., gives notice that the light-ship to mark the south end of the unfinished breakwater, Milwaukee bay, has been replaced at the expense of the engineer department.

Passenger service of the Northern Steamship Co. between Buffalo and Duluth—steamers North West and North Land—will be opened June 14 and will continue for only three months. The first boat will leave Buffalo June 14 at 10:15 p. m. The last boat will leave Buffalo Sept. 9, and the last boat from Duluth Sept. 13.

Northern Transit Co. is the name selected for the Cleveland corporation that is to own and operate the passenger and freight steamers Empire State and Badger State between Toledo, Cleveland and Ogdensburg. Names of the boats will be changed. Officers of the company are: President, C. E. Grover; vice-president, M. A. Bradley; secretary, Geo. W. Hausheer; treasurer and manager, W. A. Collier.

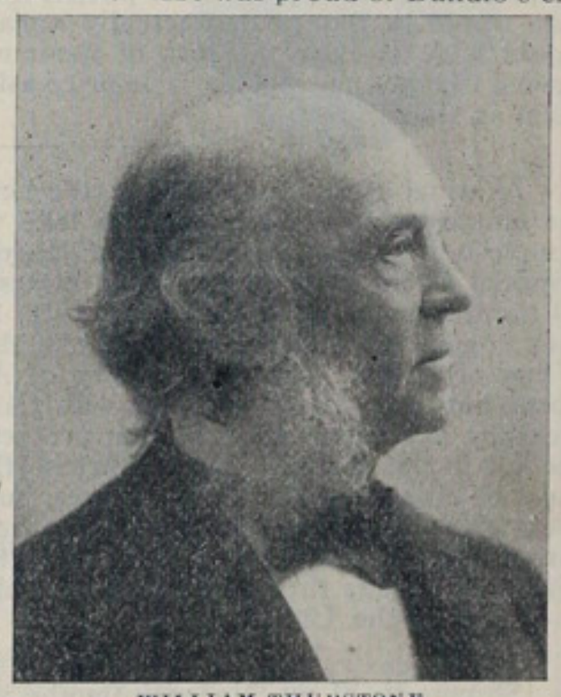
A ruling from the light-house board provides that masters, pilots and engineers of light-house vessels must secure from the steamboat inspection service licenses attesting to their ability to perform such service. Such a rule should have been enforced long ago as regards the light-house supply boats and the boats used by the army engineer officers of the light-house service, but it is probably not intended to apply to the light-ships.

Local inspectors of steam vessels at Cleveland, Capt. Geo. De Wolf and Mr. James McGrath, were both up to the 90-mark in the recent civil service examination, which was of special interest to inspectors in all parts of the lakes. This standing was expected by ship builders and ship owners who have dealings with the Cleveland board, as it is known to be among the most efficient in the country.

Mr. B. L. Pennington, chairman of the committee of the Lake Carriers' Association, appointed at Detroit in January last to take up the question of charges for trimming and unloading ore, makes report through Secretary Keep of the association. The position of dock managers at Lake Erie ports against a reduction of the 14-cent charge for unloading was explained in the last issue of the Review. Of trimming charges the committee report says: "The price for trimming ore at all shipping ports is to be 2½ cents per ton. Responsible parties have arranged to do the work. Except at Escanaba and Ashland, railroad companies owning the docks are to do the trimming. At Escanaba and Ashland private parties are to do it. The committee believes the parties are competent to do the work satisfactorily and without strikes or delays."

The Late William Thurstone of Buffalo.

Wm. Thurstone, the veteran secretary of the Merchants' Exchange, Buffalo, whose death was announced in the last issue of the Review, was well known to vessel men around the lakes. He was proud of Buffalo's extensive grain trade, and his annual reports of the commerce of that port involved great labor and were very carefully prepared. They were the best reports coming from commercial bodies on the lakes. Mr. Thurstone was thoroughly informed in all branches of lake commerce, as well as that of Buffalo. His memory will be held in high regard by everybody connected with lake shipping.



WILLIAM THURSTONE.

Mr. Thurstone was born in London, England, Feb. 21, 1826, and was therefore in his seventy-third year at the time of his death. He came to this country at the age of twenty-eight and settled in Buffalo—1855. He was thoroughly acquainted with the printer's trade and was a reporter for several London newspapers before coming to America. He was connected with several Buffalo newspapers before being appointed commercial and financial editor of the Courier, a position which he held for twenty-two years. Thirty-six years ago he was appointed secretary of the Board of Trade and later of the Merchants' Exchange, and served faithfully in that capacity until the time of his death. Mr. Thurstone was a consistent and loyal member of the Episcopal church.

Capt. Wm. H. Hazen, superintendent of the Rochester & Pittsburg Coal & Iron Co.'s docks in Buffalo, was in Cleveland, Monday, returning to Buffalo from a trip around the lakes. Capt. Hazen says that 400,000 tons of soft coal to go to Lake Superior will be moved over the Rochester & Pittsburg docks this season, in addition to the fuel business of the company and large shipments to Lake Michigan ports. The new car dump under construction at this dock will be completed about the middle of next month. It is claimed that this machine will unload eighteen cars of coal per hour.

MARINE REVIEW

DEVOTED TO LAKE MARINE AND KINDRED INTERESTS.

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The books of the United States treasury department on June 30, 1897, contained the names of 3,230 vessels, of 1,410,102.60 gross tons register in the lake trade. The number of steam vessels of 1,000 gross tons, and over that amount, on the lakes on June 30, 1897, was 399, and their aggregate gross tonnage 769,366.68; the number of vessels of this class owned in all other parts of the country on the same date was 314, and their tonnage 685.709.07, so that more than half of the best steamships in all the United States are owned on the lakes. The classification of the entire lake fleet on June 30, 1897, was as follows.

	Number.	Gross Tonnage.
Steam vessels	1,775	377,235.45
Sailing vessels and barges	1,094	594,888.87
Canal boats	361	37,978.28
Total	3,230	1,410,102.60

The gross registered tonnage of the vessels built on the lakes during the past five years, according to the reports of the United States commissioner of navigation, is as follows:

Year ending June 30, 1893	175	99,271.24
" " " 1894	106	41,984.61
" " " 1895	93	36,352.70
" " " 1896	117	108,782.38
" " " 1897	120	116,936.98
Total	611	403,327.91

ST. MARY'S FALLS AND SUEZ CANAL TRAFFIC. (From Official Reports of Canal Officers.)

	St. Mary's Falls Canals.			Suez Canal.		
	1897	1896	1895	1897	1896	1895
Number of vessel passages	17,171	18,615	17,956	2,986	3,409	3,434
Tonnage, net registered	17,619,933	17,249,418	16,806,781	7,899,374	8,560,284	8,448,383
Days of navigation	234	232	231	365	365	365

Two or three of the "yellow" type of New York papers have attacked the management of the American line on the claim that an exorbitant price has been asked from the government for ships of the line, in event of their being needed as auxiliary cruisers. President Griscom a few days ago made this statement through the Associated Press: "The International Navigation Co. was the first to offer its steamships to the government at the beginning of the present agitation. The price it named for the boats was as low as could be made, having due regard to their cost. The statement that it was so high as to prevent the government from taking the boats is absurd, for the government has the right under the postal subsidy act to take the ships whenever they are needed, the price to be settled by arbitration, if an agreement cannot be reached. While the exact price asked cannot be made public, it can be stated that it was no more than would be required to actually replace the ships, while the company would have to bear the loss of income during the two or three years needed to build new boats. The price asked was much less than $4,000,000 each, as stated."

As usual at this time of year, the newspapers contain notices against the employment of Canadians on lake vessels of the United States. A sample notice, sent out from Port Huron a few days ago, is as follows: "Special Agent Petit of the United States treasury department has notified all the owners of boats at Marine City, St. Clair and Port Huron that if they engage any Canadians on any of their boats they will be subject to a fine of $1,000. There are plenty of American seamen living at these ports, but their places are filled with Canadians, and the secretary of the treasury has been called on for protection." Ship masters understand the law in this matter. Their officers—those holding licensed positions—must be citizens of the United States, but they are not required to bother themselves about the nationality of other employees. They will be violating the law, however, if they write to Canada for men to fill minor places or engage them except upon application from the men themselves in a port of the United States.

Shipments of machinery from the works of the Brown Hoisting & Conveying Machine Co., Cleveland, indicate the extent of foreign orders on which that company has been engaged of late. A solid train of seventeen cars left the works of the company, a few days ago, for Philadelphia, to be loaded on the steamer Cathele for Mariopol, Russia. This shipment consisted of three Brown patent bridge tramways for the handling of ore at a large steel works in Mariopol. The bridges will be driven by electricity. Another large shipment, consisting of several car loads, was also made about the same time to Trieste, Austria, for the Kraimsche Industrie Gessellschaft. This shipment was via the New York & Mediterranean Steamship Co. from New York.

In again lowering the record between Southampton and New York on her last westward voyage, the North German Lloyd steamer Kaiser Wilhelm der Grosse covered 561 miles during a single day's run. The total distance covered was 3,120 miles and the average speed was 22.29 knots. The time was 5 days and 20 hours, or 2 hours and 35 minutes less than the time consumed in the best previous voyage. The best previous record westward was made by the same steamer on her maiden trip in September last. On that trip she covered a distance of 3,050 miles with an average speed of 21.39 knots. It will be seen that her average speed on this last trip was nearly a knot faster than on the previous record trip. On this last voyage, however, the big vessel steamed 70 miles further than on the former one, and it is estimated that had she come over the same course as in September, at the same rate of speed as made on her present voyage, her time of passage would have been 5 days, 16 hours and 50 minutes.

Scarcity of vessels in the Pacific coast lumber trade, due to Alaskan gold excitement, has prompted lumber shippers to undertake the building of big rafts. A raft to contain 4,000,000 feet of lumber has been begun at Portland, Ore. When completed it will be floated to San Francisco. It will be cigar-shaped, 400 feet long, 53 feet wide and 24 feet high from the water, drawing about 17 feet of water. The building of this raft is an experiment, and its performance in the open sea will be watched with interest. If successfully floated to San Francisco others of the kind will follow and the method of lumber transportation on the Pacific coast will be to some extent revolutionized.

Vessels recently purchased for the navy are being rapidly rechristened. The revenue cutter Algonquin has been christened the Accomac. The Mayflower, recently of the light-house service, will in the future be officially known as the Suwanee. The yacht Sovereign is to be called the Scorpion, and the Creole, intended for use as a hospital ship, the Solace. The capital city of Kansas will be honored by having the recently purchased gunboat, Diogenes, named Topeka. The small unnamed torpedo boat purchased in England is to be called the Manley, in honor of Capt. John Manley of Revolutionary fame. The Saturn will retain her name for the present.

The suggestion from Chicago that grain charters next winter be made subject to a fixed day for the opening of navigation is worthy of consideration from the Lake Carriers' Association. Chicago grain shippers urged vessel owners to move their ships this spring long before preparations had been made in other lines for the opening of navigation, and the results are generally to the disadvantage of the vessels. It would seem that the underwriters, who are liable to suffer heavy losses on account of vessels being sent out to buck ice in the Straits, might be of great assistance to the vessel owners in settling this question.

Alfred Noble of Chicago, president of the Western Society of Engineers, contributes an article on "Engineering Features of the Nicaragua Canal" to the February number of the journal of the society. Mr. Noble was a member of one of the government commissions of engineers that have reported on the Nicaragua canal project. He is now a member of the United States Deep Waterways Commission, engaged in making surveys for a ship-canal from the lakes to the Atlantic seaboard.

Leading ship builders of England and Scotland have been asked to submit tenders to the Cunard company for the construction of two steamers of great capacity. One of them is to be a cargo steamer, pure and simple, and the other is to be an intermediate steamer carrying 100 saloon passengers and having a speed of 16 knots, the cargo steamer having a speed of 14½ knots. Both vessels will be 550 feet in length by 62 feet in breadth, and 41 feet 6 inches in depth.

Additional appropriations for new naval vessels are found in the naval appropriation bill as reported to the senate. The new items are: Four monitors for coast and harbor defense, $5,000,000; four torpedo boat destroyers, $1,200,000. These appropriations are for the vessels without arms or armament, and it is believed that they will be sufficient for the purposes indicated. The monitors are to be somewhat smaller than existing types.

Capt. H. R. Freeman, since 1890 the representative of the maritime department of the Mutual Life Insurance Co., died at his home in New York, April 1. For nearly twenty-five years Capt. Freeman was an officer and master of the Cromwell line, operating between New York and New Orleans. He made a tour of the lakes only a short time ago in the interest of the Mutual company.

A group of some fifty famous ship and engine builders, forming the council of the Institution of Naval Architects, appears as a supplement to the March 30 issue of the Shipping World, London. Members of this council are all men of world-wide reputation, on account of achievements in ship building. The picture is a handsome specimen of photo-engraving.

Mr. E. Platt Stratton, chief surveyor for the Record of American & Foreign Shipping, New York, was in Cleveland, a few days ago. Several of the big freighters under construction in lake ship yards are being built under inspection by representatives of the American Ship Masters' Association, which publishes the Record.

The Army & Navy Journal says that the naval personnel bill will be favorably reported to the house in a few days in the exact form as prepared by Assistant Secretary Roosevelt. Navy officers feel confident that it will receive favorable consideration from both house and senate.

Lieut. James T. McIndoe of the army engineer corps, who has been in charge of government work on the lakes under the direction of Col. G. J. Lydecker of Detroit, has been ordered to New York city to report to Major Henry M. Adams for duty under his orders.

Capt. W. M. Folger, U. S. N., who was in charge of light-house affairs at the Detroit station up to a short time ago, is to command the new cruiser New Orleans, formerly Amazonas of the Brazilian navy.

It is again stated that the Newport News works is to begin the construction of new vessels for the Pacific Mail Steamship Co. This time there are to be two of them, each of 10,000 tons.

Vacuum in Feet and Inches.

Editor Marine Review:—My throat has been so sore ever since reading the Review of March 31 that I was forced to forego the pleasure of writing last week. I tried hard to swallow that 29 inches, but it wouldn't go down. But I notice one thing in connection with Mr. Kearfott's letter which explains a heap. I am deeply pained to notice that he pins his faith and stakes his reputation for veracity upon the showing made by the vacuum gauge, and not only that, but advises me to go and do likewise. Mr. Editor, the vacuum gauge can give the gas meter cards and spades. The father of lies sits at the right hand of its maker.

Once upon a time, my heart being heavy and my faith sorely shaken by the persistent prevarication of the things, I said to myself: "Now will I settle this business of lying gauges. I will have one made that no man can question." So I hied me to a concern that stood away up in the gauge business and said: "Fashion me a vacuum gauge that shall be to other gauges as Geo. Washington is to a man who sells pumps." In due time it was done, and it was a "marker." It had a beautiful nickel case with milled edges and a dust-proof French plate glass front with beveled edges that threw a Waterbury watch into dim shadow, and the stamp of truth was over all. It was sent to me by special train, watched over by armed guards and carefully packed in the finest silk wool in a burglar-proof safe with a time lock and patent lever escapement, and accompanying it came a lovely engrossed certificate guaranteeing its spotless character. We had in our plant an elaborate surface condenser, and our vacuum gauge informed us day after day that the aforesaid condenser produced a vacuum of 29 inches, but this I had the hardihood to doubt. My nice full-jeweled vacuum gauge was duly and with fear and trembling unpacked and connected without a hitch, and at last the supreme moment arrived. The cock was opened slowly and carefully. The truth-telling pointer traveled gradually around, and if the peg hadn't stopped it, it would be going yet. It went to 30 inches without bursting a button off, tho' I will say that it seemed to be getting a little groggy. So, loudly denouncing the whole race of gauges, I did what I should have done at first—put up a mercury column and found that the naked truth stood 27 inches high. I wouldn't give a red herring for the statements of the best-recommended vacuum gauge. Let Mr. Kearfott get a mercury column and undeceive himself.

Regarding the economy of the said pumps, the steam trials of the Minneapolis also tell something about their steam consumption, and those curious to learn may find it reported in the proceedings of the Society of Naval Engineers. However, they are no worse probably than any other machine of the kind, and with this I have no quarrel. No one denies, I suppose, the advantage of compounding, especially in steam pumps, but at first blush one would think from reading Mr. Kearfott's letter that there was nothing left to hope for. As for ordinary duplex pumps, I fully agree with him, and will go further and say that they are an institution of Satan, but for certain purposes they are handy to have in the house. I am convinced that as good results may be had by the use of a good single pump as by the compounding of a duplex.

Now, Mr. Kearfott, take down your finger, and don't thrust at me facts that I do not and have not questioned. My "talk" has been made entirely on the point of the vacuum to be obtained and on the inference (if not the plain statement) that by using a certain make of pump we on the lakes with our jet condensers could get a whack at that 29-inch vacuum. Does Mr. Kearfott mean to claim that with any possible combination of pump and jet condenser he can obtain anything like it? Did he ever see 27 inches vacuum with a jet condenser that was not measured by gauge? As to exhaust steam, I am sure I don't know what I have done that he should threaten me. If I have done anything I am sorry for, I am glad of it. Now, I confess that the best practice I know of as regards auxiliary exhausts is to provide a liberal heater, liberal enough to absorb all the heat contained in the exhaust steam, to condense it all in fact, and to place it high enough to allow the water of condensation to flow into the feed-pump suction. A certain concern in the pump business, and with whom Mr. Kearfott had at one time something more than a speaking acquaintance, used to claim that by using a heater the more steam you put through your auxiliaries the better the economy obtained. Did you, Mr. Kearfott, ever preach this doctrine? Well, times change, and you are a good fellow, and the last time we were together we had a good time, and it isn't your fault if the pumps you sell are not the best on earth. When I buy some I want 29-inch vacuum ability with each; and when you come to Oshkosh I will try to convince you that, although we may not be as perfect "suckers" as your pumps, still our suction is unimpaired. I am, very truly,

ENGINEER.

Oshkosh, April 9, 1898.

The Submarine Torpedo Boat.

Rightly or wrongly, the naval world believes that the production of a successful submarine torpedo boat will mark the greatest revolution that has ever occurred in naval warfare. The change from sails to steam, the introduction of armor plate, the breechloading gun, the advent of the torpedo and the torpedo boat, have all in their turn produced radical changes in the construction and the tactics of war vessels, but not any one of them has ever produced the upheaval of long-established customs or the distrust of accepted theories which will occur on the day that a thoroughly practical submarine boat makes its appearance. There is a general belief that an effective under-water warship would have the above water ship at its mercy, and we think the belief is well founded.

Of all naval devices that have been made the object of painstaking invention, there is probably none whose history at once dates back so far and includes so many repeated and heartbreaking failures. We say this with the knowledge that submarine boats have been built which have contained many of the elements indispensable to success. Unfortunately, in most cases there have been defects which ultimately relegated the device to the rubbish heap. The reason for this is not far to seek. Submarine navigation and warfare are in the nature of things so difficult, are beset with so many contingencies, that the ships in which they are carried on must be marvels of ingenuity and constructive skill and must meet a number of exacting requirements which never trouble the designer of a ship of the ordinary type. For instance, in these days of 20-knot warships with their great helm power, a successful submarine boat must be swift and capable of rapid maneuvering. It must be able to run at various degrees of submersion without any liability either to plunge or to rise to the surface. It must be capable of maintaining the same course after diving as it was holding on the surface. It must be capable of approaching the enemy unseen, or, if any part of it be visible, it must be so small as to be safe from destruction by rapid-fire guns. The boat should be large enough to contain a full crew and abundance of ammunition, for there is no reason to suppose that submarine artillery will miss the mark less frequently than that in use above water. Moreover, the motive power must be of a kind that will not fill the vessel with poisonous products of combustion, and, above all, an absolutely reliable system of air supply must be provided for the crew.

In the century or more which has elapsed since serious attempts were first made to build a submarine boat, America has played an important part, the first at all practicable vessel being built toward the close of the last century by Bushnell. This tiny craft all but succeeded in destroying the British ship Eagle, and, considering the time in which it was built, there is more credit to be given to Bushnell's boat than any of its successors, which have had the experience of their predecessors to guide them.

The celebrated Fulton was the next to grapple with the problem, and the story of his Nautilus is well known. Philips' boat, launched in 1851 on Lake Michigan, deserves notice, and next to that came the French boat Le Plongeur. The destruction of the United States steamer Housatonic by a submarine boat showed the tremendous possibilities of this form of warfare. Passing by several more or less successful attempts after the civil war, we come to the celebrated Nordenfeldt boat, and later that of Goubet. Considerable claims are made for these craft and for the French boats Zedè and Gymnota, and the Spanish boat Peral. It is for obvious reasons difficult to obtain accurate information regarding the performances of these vessels; but the fact that they are not being built in any numbers suggests that their success has been limited.

The Holland boat, which is now attracting a great deal of attention in this country, is the last of several that have been built by the inventor during the past twenty years. It embodies the results of a wide experience, and its trials indicate that the type contains all the elements of success. The larger boat, the Plunger, nearing completion at Washington, will have speed, great offensive power and a wide radius of action. It will be capable of joining a fleet, cruising with it and forming part of the line of battle.

It is scarcely necessary to point out the deadly execution which could be wrought by such a vessel, not merely at night, but in an open battle by day upon the high seas. If the ordinary torpedo boat destroyer, which makes its dash upon the enemy in the open at the risk of being sunk by gun fire, is so dreaded by the larger warships, what shall be said of a torpedo boat which can sink beneath the waves and deliver half a dozen torpedoes from an unseen and unassailable position? If it is deadly by day and in the open, it will be doubly so by night. No searchlight would be powerful enough to detect the insignificant conning tower of an approaching submarine boat before it was well within striking range. No roadstead would be secure from its attack, and no fleet would dare to enter a harbor defended by these invisible, swiftly moving and destructive little craft; indeed, it is difficult to imagine just what would happen if a flotilla of these deadly little vessels were dispatched against a fleet of the enemy's ships.—Scientific American.

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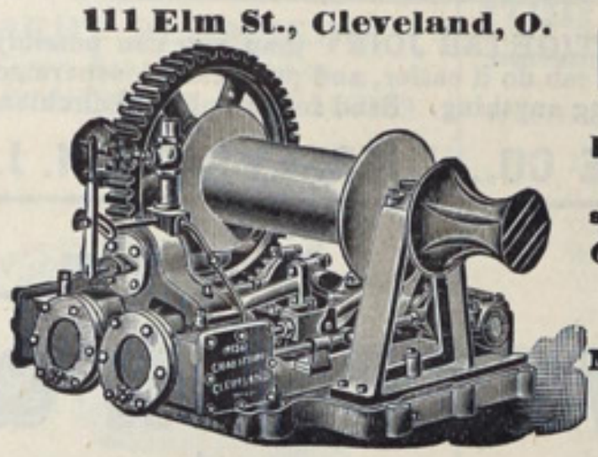

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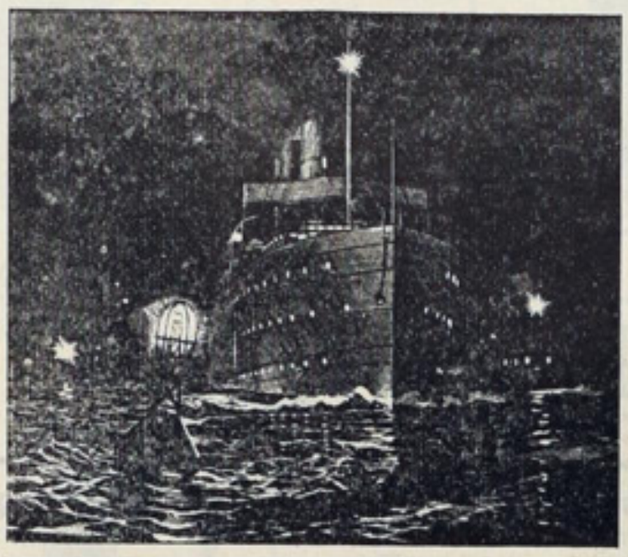

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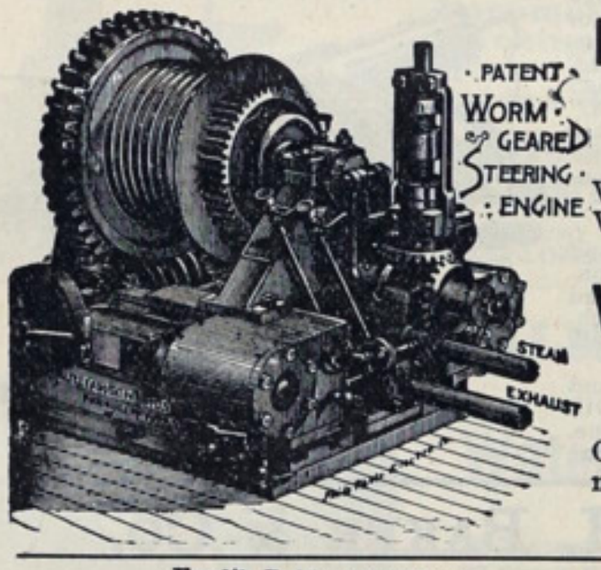

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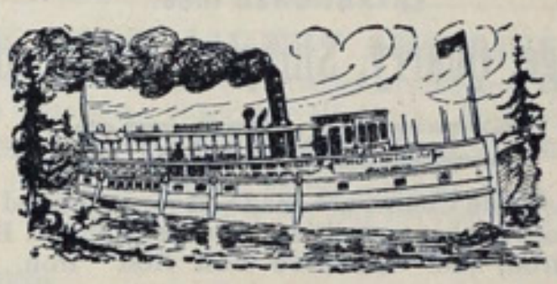

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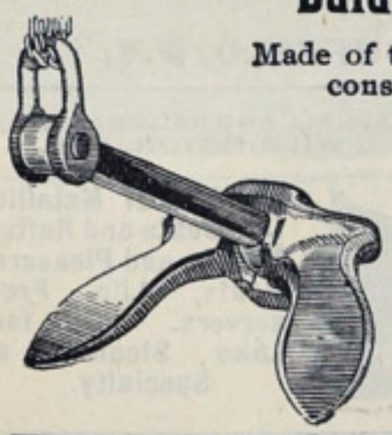

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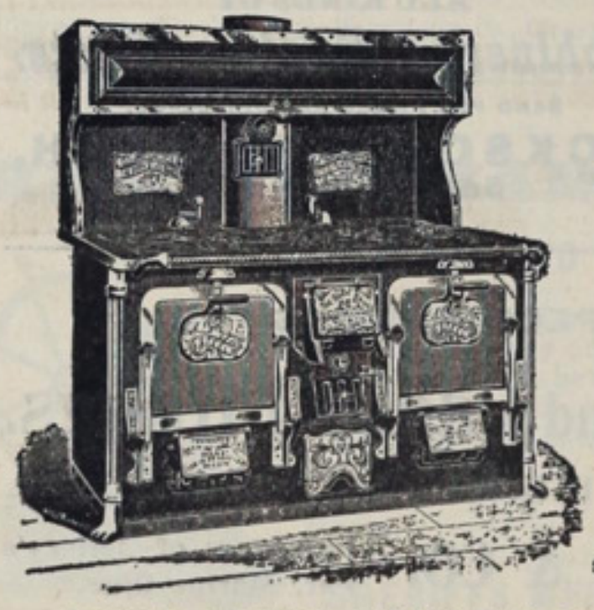

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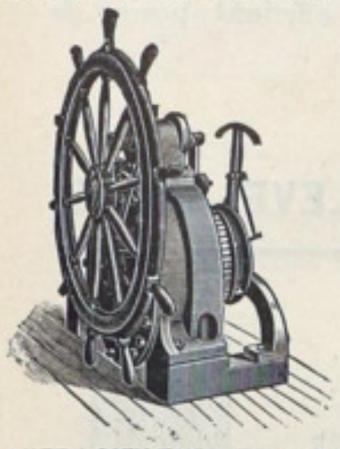

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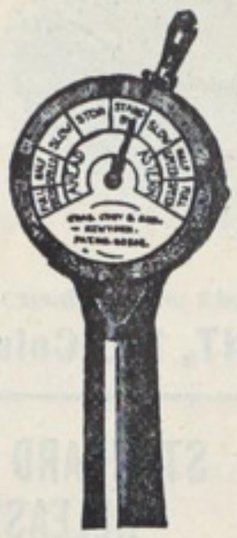

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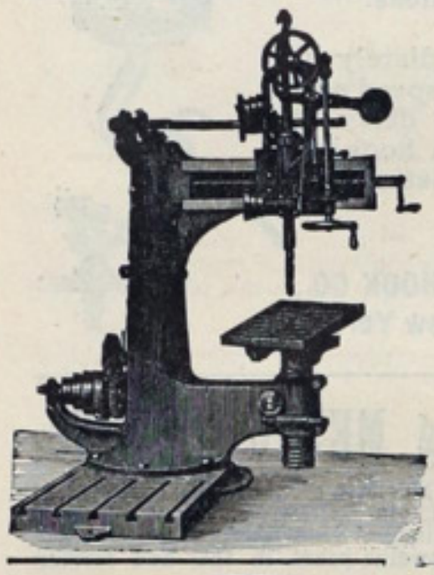

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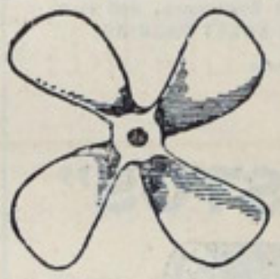

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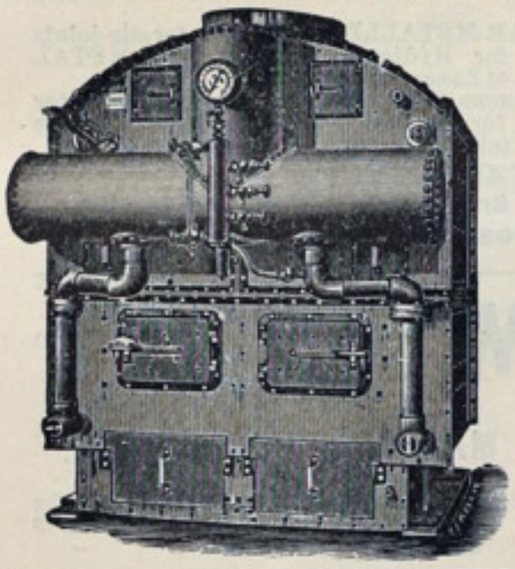

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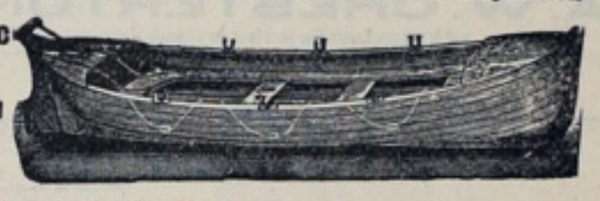

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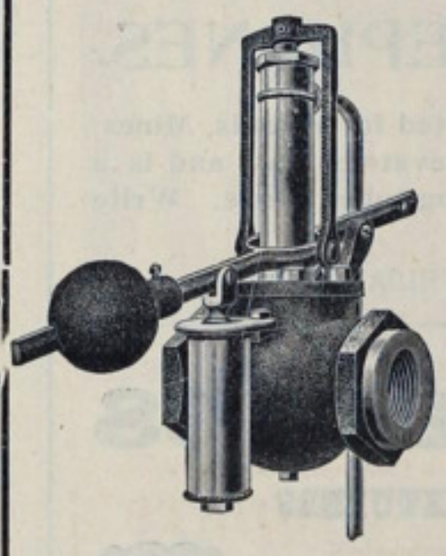

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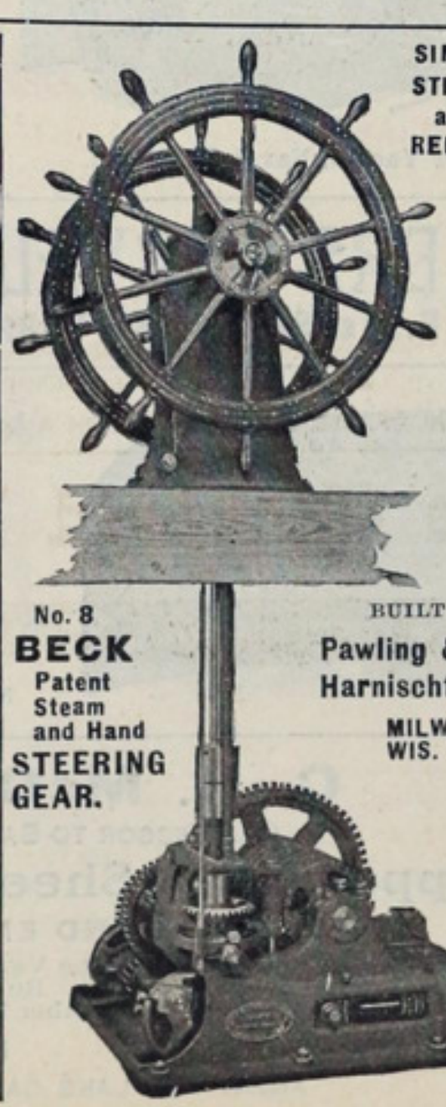

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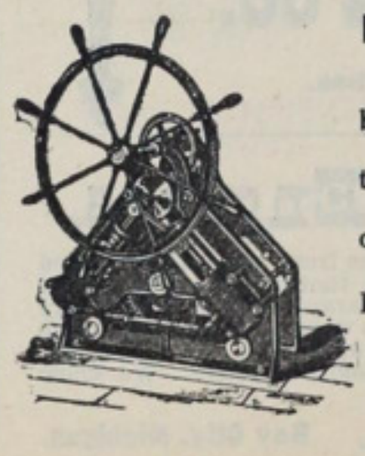

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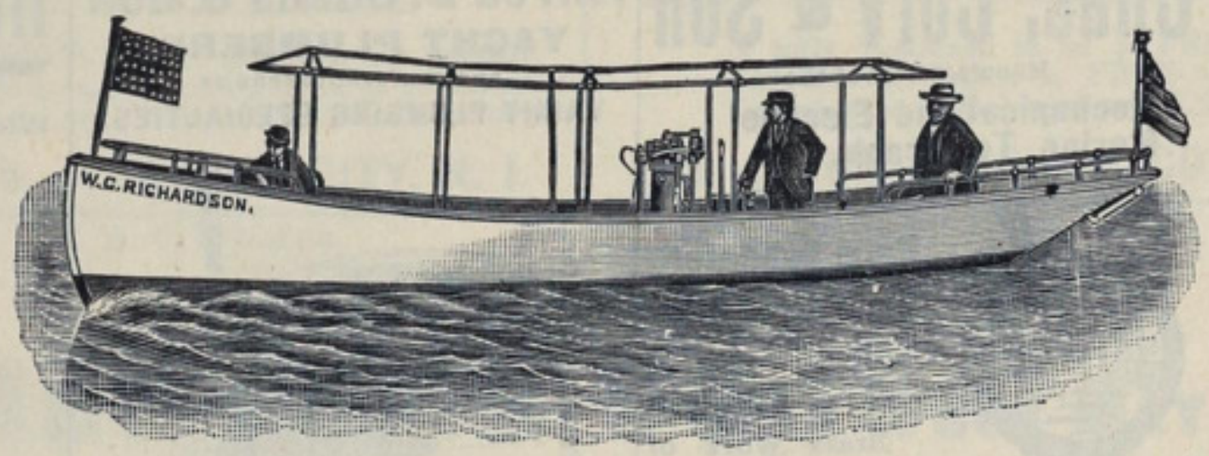

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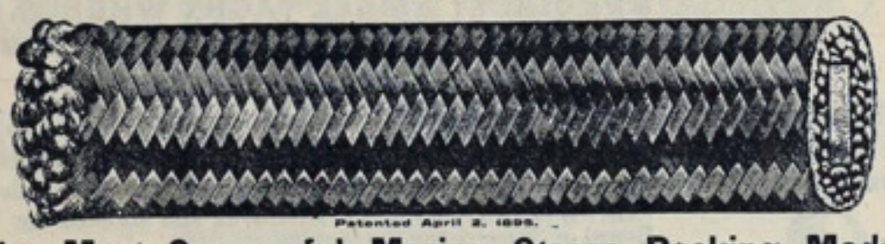

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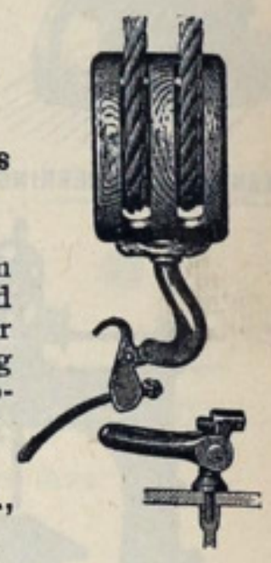

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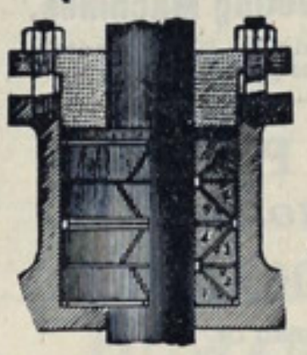

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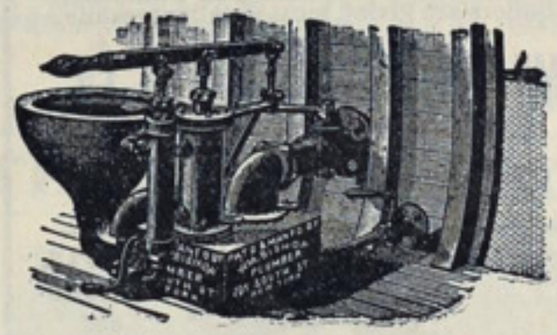

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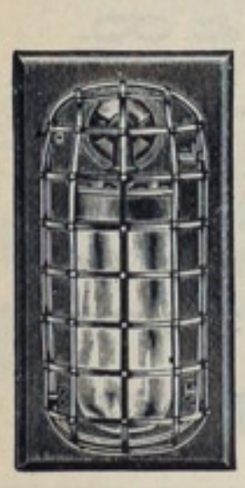

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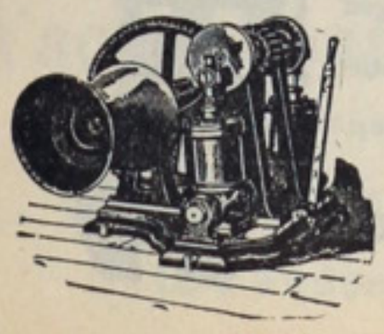

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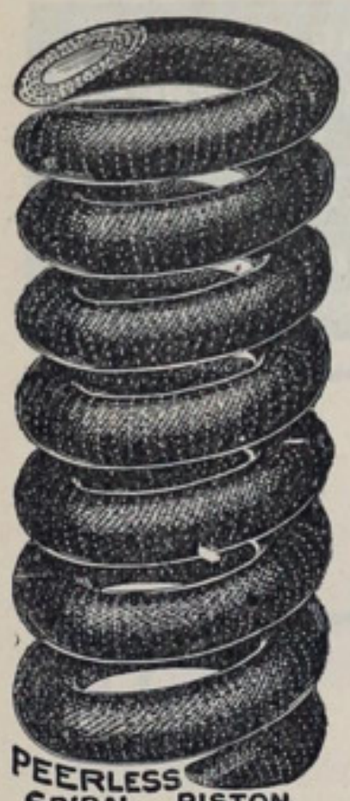

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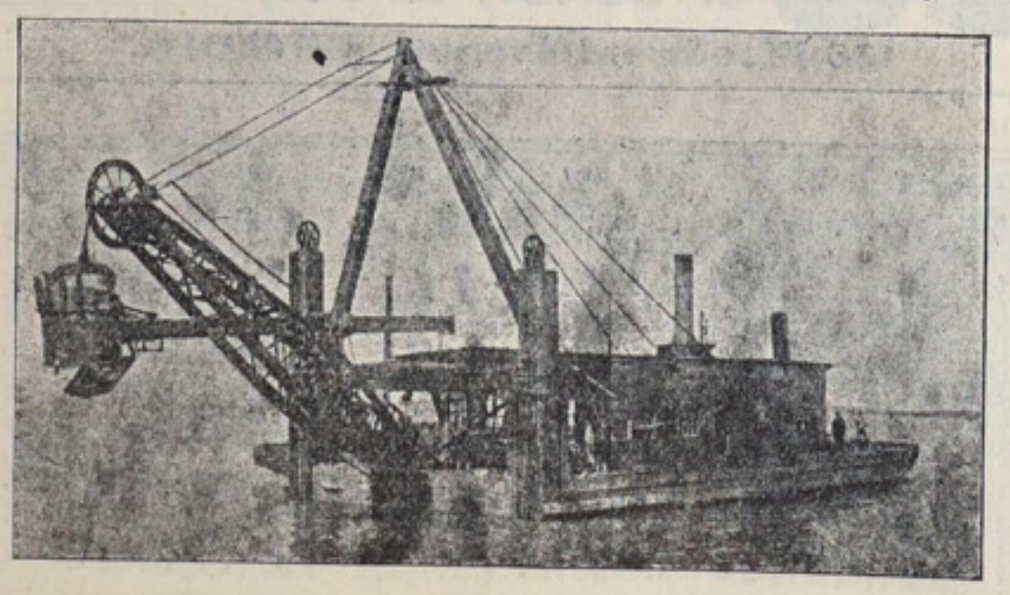

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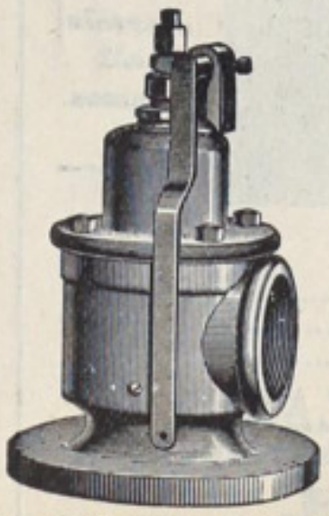

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